STATUS SHEETS
CALENDAR YEAR 1941

APPALACHIAN FOREST EXPERIMENT STATION

RS - AP
SILVICULTURE
Harvest Cuttings

January 1, 1942

PROJECT STATUS SHEET

Harvest Cuttings

Field division: Forest management research.
Work project: Silviculture.
Line project: Harvest cuttings.
Purpose: To determine the methods of harvesting merchantable products that will provide the greatest sustained income. (Eventually to cover all forest types in Station's territory.)
Review of past work: Past work in harvest cuttings has dealt mainly with the development of silvicultural systems. Examinations of cutover land and controlled experiments show that most of the Appalachian hardwood types can be perpetuated by all-aged management; that is, "selective or partial cutting systems". It has been shown, however, that although such cuttings in hardwood stands result in definite increases in the volume growth of the remaining trees by the reservation of the more rapid growing individuals, and because of the acceleration of their growth through reduction of competition, there is a tendency toward reduction in quality of these trees due to the development of epicormic branches. It has further been shown that heavy partial cuttings in mature stands of eastern hemlock or loblolly pine are frequently followed by considerable mortality in the residual stands.
Accomplishments during past year: Much of the year was devoted to preparation for the management of two experimental forests. An inventory was made of the resources of the Lee Experimental Forest in the Virginia Piedmont; one-half the forest, approximately 1,300 acres, has been set aside for intensive management. A similar unit of 2,200 acres on the Bent Creek Experimental Forest was cruised, and data basic to intensive management were collected. The data have been summarized and preparation of the management plan is now in progress. The study of pulpwood harvesting costs under various silvicultural methods was completed and accepted for publication. A demonstration timber marking area for the purpose of training timber sale personnel was established in cooperation with Region 7 and the George Washington National Forest.
Plans for next year: The management of the experimental forests has highest priority. One of the essential features of management will be the development of the economic principles underlying forest practices, involving the keeping of complete cost and return records of all operations, thereby indicating the financial risks and return of a forest enterprise. Such management will afford an opportunity to test, on a large scale, the results of many years of research in forest management. In addition it is planned that analysis will be continued and publications prepared on the development of epicormic branches and acceleration of growth following partial cutting.

Date of completion: Project as a whole is continuous. Management of the experimental forests is continuous and will be expanded to embrace experimental forests in other types. Short-time studies designed to supplement the management of the experimental areas will be terminated upon publication of the results.

Assignment: L. I. Barrett, L. E. Chaiken, A. A. Downs.

RS - AP
SILVICULTURE
Stand Improvement

January 1, 1942

PROJECT STATUS SHEET

Stand Improvement

Field division: Forest management research.
Work project: Silviculture.
Line project: Stand improvement.
Purpose: To develop standards for ultimately profitable improvement measures that will maintain or improve the growth rate and stem and stand quality of juvenile stands and run-down forests of older age classes.

Review of past work: Experiments have been established to test the efficiency of different methods of weeding three of the most valuable mountain hardwood species. A study on the pruning of white pine has been in progress for 6 years and also has yielded usable results issued in a technical note. A 10-year-old experiment is in progress on the liberation of white pine from a decadent and unmerchantable overstory. A number of thinning experiments, established 6-25 years ago, are testing the procedures and results of thinning white, shortleaf, and loblolly pines, sugar maple, yellowpoplar, and mixed oaks. One of the most pressing problems in stand improvement is how to rehabilitate the deteriorating stands so prevalent in the southern Appalachian hardwood types; plots testing 5 treatments were established 11 years ago. E.C.W. Forestry Publication No. 1 and USDA Tech. Bulletin No. 476 both dealing with stand improvement measures in the Southern Appalachians have been published.

Accomplishments during past year: A manuscript on the early responses of some hardwoods to weeding has been submitted for publication. The analysis showed that 3 broad types of trees must be recognized in weedings: (1) those trees that are capable of maintaining their position in the stand and do not need weeding; (2) those trees that need aid to compete successfully with the surrounding vegetation and benefit from weeding; (3) those trees that have been injured or suppressed so much that they will not benefit from weeding.

An analysis of 5 years' growth of pruned white pine shows that 26-35 percent of the living whorls can be removed without decreasing the growth rate significantly.

A manuscript on 20 years' results of thinning in the Biltmore plantations has been submitted for publication. The results show that thinnings not only salvaged material that otherwise would have been lost, but increased the growth and quality of the remaining trees.

Plans for next year: The manuscript on the growth of pruned white pine will be completed and the data on liberation of white pine will be analyzed and a manuscript prepared. Utilizing the recent knowledge gained in the experiments dealing with methods of weeding, a set of practical operating rules will be prepared and applied to an area with the object of practical test and investigating costs and returns of weeding. Thinning and rehabilitation

plots will be remeasured.

Date of completion: Project as a whole is continuous. Experiments in weedings, prunings, and thinnings have been aimed primarily toward the development and perfection of methods. This phase is rapidly coming to a close and further work will be pointed toward investigation of costs and returns of stand improvement.

Assignment: A. A. Downs, E. H. Frothingham.

RS - AP
SILVICULTURE
Silvics

January 14, 1942

PROJECT STATUS SHEET

Silvics

Field division: Forest management research.
Work project: Silviculture.
Line project: Silvics.
Purpose: To determine basic factors essential to establishment and early survival of important timber species; to detect and report ecological trends important in forest management.
Review of past work: In 1935 records were started on the production of acorns by 210 trees of the following species of oak: white, scarlet, black, chestnut, and northern red. In 1936 a study was begun to measure the amount of seed disseminated in a clear-cut strip adjacent to a mature stand of loblolly pine. The clear-cut strip was widened early in the spring of 1940 and the traps were redistributed over the larger area. A heavy crop of seed was produced in 1936 by both the oaks and the pine, and good crops were produced by the oaks in 1938 and by the pine in 1939. Other seed crops since the records were begun have been only fair or poor.

A technical note was issued late in 1940 summarizing the results of experiments and observations on the adequacy and efficiency of seed trees of loblolly and shortleaf pines.

A study of the invasion of hardwoods into pine stands was made in the Piedmont region in 1938. This gave a quantitative measure of the aggressiveness of that invasion in relation to age of stand, fire history, and site conditions, and emphasized the general trend toward development of conditions inimical to maintenance of high proportions of pine in future stands. A manuscript covering this study is now under review, preparatory to submission for publication. Results from both pure and hardwood seed production studies were drawn on in drafting preliminary minimum cutting rules in case forest regulatory laws become a reality.

Accomplishments during past year: Measurements of oak and pine seed production were continued. A small supplementary study to determine the viability of insect-damaged acorns showed them to be capable of germination so long as radicle, plumule and any appreciable part of the cotyledonary tissue remain intact and united. A second finding was that the proportion of weevil-infested acorns continues to increase from fall to spring, resulting in nearly complete infestation by the end of May.

Two months were spent on detail to the Lake States Station assisting in preparation of a seed manual for forest seeds.

Preparation of problem analyses for new work in silvics has been started.

Plans for next year: Continue existing seed production studies, probably with modifications in design so as better to cover questions emerging from problem analysis now in course of preparation. Problem analysis to be completed, and new studies to be started as dictated

by that analysis. Summarization and publication of results of the acorn production study, once scheduled for this year, will be done next year, thus covering all records obtained under the original design followed since 1935.

Date of completion: Project is continuous and scheduled for expansion.

Assignment: W. E. McQuilkin, L. I. Barrett.

RS - AP
REGENERATION
Planting

January 1, 1942

PROJECT STATUS SHEET

Planting

Field division: Forest management research.
Work project: Regeneration.
Line project: Planting.
Purpose: To determine the best planting and direct seeding methods and the best species adapted to the various site conditions and subregions within the Station's territory.
Review of past work: First exploratory planting experiments were begun in 1923 in the cutover and burned spruce type of the mountain region. Large numbers of coniferous species, including exotics, were tested in this type. After an examination in 1939 results published in 1940 showed that southern balsam fir, red spruce and Norway spruce gave best promise of success.

Description and classification of plantations established on the Biltmore Estate in North Carolina were completed and published as U. S. Dept. Agr. Misc. Pub. No. 61, 1930.

In 1938 and 1939, eight large-scale planting experiments involving 700 plots and dealing with problems of abandoned lands in the Appalachian Valley were established in cooperation with the Tennessee Valley Authority. Using planting specifications from a third-year examination, a "pilot plant", including 720 acres of plantable land was surveyed for reforestation.

Reconnaissance and analysis of the planting problems in the red spruce type were completed and a report and publication prepared. A working plan was written and the larger portions of the experiments established in 1940. First-year examination was made and data analyzed.

An intensive study of various methods of pine direct seeding in prepared spots was begun in the Piedmont region in 1939. Examinations were carried out during the summer and fall of 1939 and data analyzed. Further tests were established in 1940.

A number of experiments were established in 1935 to test methods of planting white pine in laurel and rhododendron thickets. An examination in 1940 showed that such thickets can be successfully replaced by white pine.

A study completed and published in 1939 helped point the way to a now general substitution of random or mechanically spaced lines of milacre plots for the staked row system of plantation examination.

Additional small studies started and still continuing are yellowpoplar interplantings, oriental chestnut, hybrid poplar, and a white pine spacing experiment.

Accomplishments during past year: Results from the cooperative planting experiments in the Appalachian Valley have provided the basis for a preliminary planting chart showing the species best adapted to

various sites. It also shows the site characteristics of major importance in choosing the proper species. The chart was released in two publications -- one technical note, and one paper read before the Soil Science Society. The third-year examination was made on plots of that age and the 720 acres of "pilot plant" plantings were completed by a Tennessee Valley Authority CCC Camp. A short supplement to the technical note for very limited distribution was prepared for conditions in southwestern Virginia.

Planting and seeding on the remainder of the experimental plots in the spruce type were completed and a technical note prepared on results to date.

Examination of the pine direct seeding in the Piedmont region was completed and a manuscript prepared for publication.

A technical note and a publication were completed on the results of interplanting laurel and rhododendron thickets with white pine. A technical note was issued summarizing the results of 30 to 50-year-old plantings on the Biltmore Estate, near Asheville, N. C. This gives simple rules to be followed in making such plantings.

A plan, including economic justification, was completed for the reforestation of the open land of the management unit of the Lee Experimental Forest. A survey of available areas was made and a working plan for planting and direct seeding experiments and demonstrations on research units of the Lee Experimental Forest was written. The importance of red cedar as a high income species in the Piedmont region was one result of this analysis. Further investigation showed that very little was known regarding the planting and management of the species and that considerable research is needed.

Plans for next year: The fifth-year examination on survival and growth of the Appalachian Valley experiments will be made and some release cuttings made where needed. A start will be made on analysis of these data and publication of results.

An examination will be made of all spruce regeneration plots on the Monongahela and Pisgah National Forests, data analyzed, and the results prepared for publication. Routine release work on the spruce regeneration plots will be made.

Plots will be laid out and a start toward seeding and planting of experiments and demonstrations on the Lee Experimental Forest will be made. A portion of the planting on the management area of the Lee Forest will be completed according to the planned reforestation schedule.

A technical note on the pine direct seeding in the Piedmont region will be prepared.

Date of completion: Project as a whole is continuous. Complete data on fifth-year growth and survival of the Appalachian Valley plots will be available in 1944, and complete third-year data on the spruce regeneration study in the same year. It is anticipated that a year-by-year flow of information and results will be available from the planting studies. Major objectives of the Piedmont direct seeding study will be completed in 1942.

Assignment: L. S. Minckler, W. E. McQuilkin.

RS - AP
REGENERATION
Seed Studies

January 1, 1942

PROJECT STATUS SHEET

Seed Studies

Field division: Forest management research.
Work project: Regeneration.
Line project: Seed studies.
Purpose: To determine the importance of seed source in artificial regeneration.
Review of past work: An experiment to determine the growth and survival of loblolly pine progenies from mother trees of various characteristics was established in 1936 on the Francis Marion National Forest in South Carolina. The last examination was made in 1939 and the study is necessarily terminated because the area was flooded by the Santee-Cooper Hydroelectric Development.

Tests of the importance of geographical origin in the growth and survival of black locust were established in the spring of 1936 on the Bent Creek Experimental Forest, but because of general plantation failure and deer browsing, results have been negligible.

Accomplishments during past year: A manuscript giving the results of the loblolly pine source of seed study has been prepared and accepted for publication. The study showed highly significant statistical differences for both early growth and survival of progenies from different mother trees although no correlation between this early height growth and survival, and any observable characteristics of the adult mother trees could be established. Because of flooding by a power project all observations on progenies had to be taken when trees were only 6 years old. The study has been terminated.

A final examination of the black locust plots were made and the study terminated.

Preliminary plans have been made for seed source studies and demonstrations on the Lee Experimental Forest.

Plans for next year: Plans will be completed and plots laid out for seed source studies of two or three coniferous species on the Lee Experimental Forest.
Date of completion: Project as a whole is continuous. The loblolly experiments in South Carolina were completed in 1941.
Assignment: L. S. Minckler.

RS - AP
REGENERATION
Studies
Nursery

January 1, 1942

PROJECT STATUS SHEET

Nursery Studies

Field division: Forest management research.
Work project: Regeneration.
Line project: Nursery studies.
Purpose: To determine the most effective and economical means of improving the soil at Parsons nursery, both from the standpoint of ease of nursery operation and production of better planting stock.
Review of past work: None has been done by this Station.
Accomplishments during past year: Preliminary plans were made at a conference of the Region, National Forest, Nursery, and Appalachian Station personnel.
Plans for next year: A working plan will be prepared and experiments on both seedbed and transplant bed areas established at Parsons nursery. Major efforts will be directed toward determination of the amounts of compost and methods of application which will result in the needed soil improvement.
Date of completion: The main objectives of this particular experiment should be completed by about 1945. Preliminary results will be available as early as 1943.
Assignment: L. S. Minckler.

RS - AP
MENSURATION
Stand Studies

January 1, 1942

PROJECT STATUS SHEET

Stand Studies

Field division: Forest management research.
Work project: Mensuration.
Line project: Stand studies.
Purpose: To determine growth, yield and mortality of forest stands representing the important timber types of the Appalachian Station territory and to develop improved methods of growth, yield and mortality predictions.
Review of past work: Field data for non-normal yield tables for loblolly, shortleaf and Virginia pine have been collected. Non-normal yield tables for loblolly pine pulpwood were issued in a technical note and much of the preliminary computation for non-normal yield tables for the other two species has also been completed. A new form of yield equation was developed and found to simplify the work necessary for the preparation of these yield tables for all three species.

No satisfactory quick method has been devised for determination of growth in the all-aged stands of many species typical of the mountain types. It has been apparent for some time that development of accurate growth predicting techniques for such stands must be based on careful long-time observations of permanent sample plots. Nearly 3,000 such plots were established in 1933 and 1934.

Accomplishments during past year: Remeasurement and preliminary computation of the 3,000 permanent growth plots were completed. Arrangements were effected for continuing analytical phases of the work at Duke University, under a working plan completed during the year.
Plans for next year: The comparison of prevalent methods of growth prediction with actual growth as determined from the permanent sample plots and the derivation of a more reliable and efficient growth predicting method will be completed. Investigations of the optimum diameter distribution for all-aged stands of major types will be started.
Date of completion: First results on growth and mortality of all-aged stands of mixed species in mountain types will be completed in 1942. Results of investigations of optimum diameter distributions for all-aged stands during 1943.
Assignment: J. H. Buell, L. I. Barrett.

RS - AP
MENSURATION
Tree Studies

January 1, 1942

PROJECT STATUS SHEET

Tree Studies

Field division: Forest management research.
Work project: Mensuration.
Line project: Tree studies.
Purpose: To develop: (1) accurate methods for determining the volume of individual standing trees; (2) factors for converting wood volume from one unit of measure to another; and (3) a tree classification for important timber species.
Review of past work: Cubic-foot and cordwood volume tables and cordwood converting factors for second-growth loblolly pine have been completed.

Board-foot volume tables for important timber species in mountain hardwoods were prepared in 1936 and used by private foresters and in management plan and acquisition surveys in some southern Appalachian forests. Volume tables showing the amount of cordwood that can be removed from the tops of various species of oak above sawlog utilization have been prepared. Factors for the conversion of oak cordwood into solid cubic feet, units of stacked wood, and board feet have been completed.

Exploratory studies in tree classification of loblolly pine and white oak have been conducted. It was found that, although a classification for determining the gross increment of individual trees could be made, the ultimate criterion of net value increment could not yet be determined because of inability to forecast the growth of decay and the lumber grade yields of trees of different sizes.

Work was begun on volume tables for Appalachian species based on form as well as d.b.h. and height, and on a study of the relation of form to locality, and of the possibilities of combining species in form class volume tables.

Accomplishments during past year: The manuscript on stacked unit-cubic foot and stacked unit-board foot converting factors for oak cordwood was published. A technical note presenting the tables of cordwood volume in oak tops was issued. Final computation and checking of form class volume tables for 16 species in Scribner Decimal C, International 1/4", and Doyle-Scribner log rules was completed and an introduction describing their use prepared. Stacked unit-board foot (Doyle Scale) converting factors for loblolly pine were prepared at request of a southern state which was investigating the pulpwood industry.

Plans for next year: Publish form class volume tables. Test their utility as basis for local volume tables and determine usefulness of these local tables in making tree sales on experimental forests.

Date of completion: Project as a whole is continuous. See plans for next year for completion of current work.

Assignment: J. H. Buell, L. I. Barrett, L. E. Chaiken.

RS - AP
MENSURATION
Statistical Studies

January 1, 1942

PROJECT STATUS SHEET

Statistical Studies

Field division: Forest management research.
Work project: Mensuration.
Line project: Statistical studies.
Purpose: To develop new techniques and methods of expressing the laws of forest growth and measurement.
Review of past work: This project as a whole is inactive and is used primarily as a means to provide an outlet for discoveries made during the conduct of other work. New Abney level correction tables providing for expanded use of this instrument have been published.
Accomplishments during past year: A manuscript describing methods of constructing circular slide rules to solve linear equations was submitted for publication. Further revision of the manuscript describing a test for curvilinearity in multiple regression equations was found necessary and this work remains incomplete.
Plans for next year: Review work on test for curvilinearity.
Date of completion: Project as a whole is continuous. New procedures and techniques in statistical methods will be published as they are developed in connection with other work.
Assignment: J. H. Buell.

RS - AP
FIRE
Control

January 1, 1942

PROJECT STATUS SHEET

Fire Control

Field division: Forest management research.
Work project: Forest fire protection.
Line project: Fire control.
Purpose: To develop methods for determining economic fire control objectives, to determine standards of detection and speed and strength of attack required to meet the objectives and based upon different degrees of occurrence, visibility, fuel type, inflammability, and potential damage; to develop devices which will enable the dispatcher to determine quickly and accurately the most efficient size and type of organized suppression unit to send to every fire; to find out how to divide the total fire protection money resources most productively among prevention, preparedness, and suppression; to develop instruments, and techniques for increasing detection efficiency.

Review of past work: Major emphasis has been placed on detection planning and visibility studies. Definite accomplishments include the development of (1) techniques for seen area mapping and lookout-point evaluation, (2) a haze meter for non-mountainous country, (3) a new eyesight test for forest lookout men, and (4) a haze-cutting filter to aid detection. A three-year field study of variations in visibility distance has been completed, and theoretical considerations of visibility problems have been worked out. Manuscripts have been published describing a plains haze meter and its use, a method of planning a lookout system, geographic and seasonal variations in visibility distance, and an eyetest for lookout men. Some work has been done on a comprehensive study of the theory and application of visibility and its measurement. A contribution toward a regional fuel type classification was made by fire report analysis.

Accomplishments during past year: A haze-cutting filter was developed which has considerable promise as a device for increasing the visual range of small smokes. An extensive test in three western regions during the summer has been transferred to the south and east during the winter. Preliminary results indicate the device may be useful particularly in identifying smokes against sky backgrounds, questionable smokes, and topographic features to aid accurate location of fires. A manuscript describing the filter has been published. Work has continued on a major manuscript on theory of visibility. Fire report data have been assembled for reanalysis to determine rate of spread and resistance to control by fuel types and danger classes, a step necessary to preliminary drafts of a dispatcher's manpower meter.

Plans for next year: The manuscript, "Theories of visibility and their application in forest fire detection", will be completed for Departmental publication. Complete mansucript on haze for the

Monthly Weather Review and the paper on visual perception of small objects, which was an outgrowth of the eyetest studies. Analyze fire reports for the past four years for the purpose of revising fuel type classification and determining rate of spread of fires by danger classes and fuel types. Prepare results for release in a technical note. A new study in fire prevention will be started by making a case study of the man-caused fire problem on a selected area. This study should lead to formation of a systematic methodology applicable to fire prevention problems.

Date of completion: Manuscripts on haze and visibility studies - 1942. Results on rate of spread and resistance to control - 1942. Fire prevention study - indefinite.

Assignment: G. M. Jemison, G. M. Byram, J. J. Keetch, P. W. Warlick.

RS - AP
FIRE
Behavior

January 1, 1942

PROJECT STATUS SHEET

Fire Behavior

Field division: Forest management research.
Work project: Forest fire protection.
Line project: Fire behavior.
Purpose: (1) To determine the fundamental laws of ignition and combustion and their application to the behavior of forest fires and (2) to develop methods of measuring the temporary or fluctuating fire danger variables and of integrating them into numerical ratings, the better to enable fire control officers to (a) determine when different types of prevention, preparedness, and suppression activities are justified, (b) rate efficiency of fire prevention and control more accurately, and (c) finance fire control on a sound business basis.
Review of past work: Fire danger meters have been developed for mountain and coastal plain regions and have been tested on an extensive scale. Results of an analysis of danger station records were used to check and improve meters and aid in fire control planning. Studies of fire weather conditions at six altitude and aspect stations have been under way for three years. A technical note on the danger rating system was issued, and manuscripts on the Appalachian fuel moisture scales and on the effect of sun and wind on fuel moisture were published. Some theoretical work has been done on fundamentals of combustion with particular reference to rating relative inflammability of different fuel types and crown fire danger. Some progress has also been made on determining the dynamics of water relations in wood.
Accomplishments during past year: Theoretical work on the fundamental relationship between fire behavior, relative inflammability, wind velocity and fuel type was continued. A manuscript on the relation of solar radiation to fuel moisture was submitted to the Journal of Agricultural Research. Field and laboratory work to determine the effects of terrestrial radiation on fuel moisture was completed. Radiation data have been worked up in a form so that solar influences on fuel moisture can be determined by the fire dispatcher. The mountain type danger meter was revised after analysis of records and a new instruction booklet for observers, covering all phases of measurement of danger and use of ratings was prepared. A summary of all ignition studies made by research agencies was completed and a technical note was published giving the highlights of past investigations on fire brands. A danger station network was established in the Tennessee Valley in cooperation with the TVA for the purpose of uniting the work being done by the ten protection agencies there and pooling information useful to all. Preliminary analyses of first year data have been made and results will be distributed to all units.

Plans for next year: Complete and submit for publication the following papers: (1) Terrestrial radiation and forest fuel moisture, (2) Possible causes of large crown fires in coniferous forests, and (3) Fuel moisture tables for dispatchers, to show fuel moisture equilibria on all slopes and aspects. Routine checks of mountain and coastal plains meters and the study of fire danger rating as influenced by altitude and aspect at danger station location will be continued. Records obtained to date from this study will be analyzed to determine whether results are conclusive enough to justify publication and closing out of the study. Analysis of danger station records will be made to determine how many stations are required per 100,000 acres to sample moisture and wind with a desired accuracy.

Date of completion: Terrestrial radiation and forest fuel moisture manuscript - 1942. Possible cause of crown fires in coniferous forests - 1942. Dispatcher's fuel moisture tables - 1943. Combustion and inflammability - indefinite.

Assignment: G. M. Jemison, G. M. Byram, J. J. Keetch, P. W. Warlick.

RS - AP
FIRE
Effects

January 1, 1942

PROJECT STATUS SHEET

Fire Effects

Field division: Forest management research.
Work project: Forest fire protection.
Line project: Fire effects.
Purpose: To ascertain the effect of fire on standing timber, reproduction, other vegetation; site; and all other important resources such as water, game, forage, and recreational facilities; in order to furnish information basic to (a) the formulation of sound fire prevention and control plans, policies, and objectives, (b) the appraisal of fire damage, both direct and indirect, and (c) the determination of the value of fire as a tool in forest or game management.
Review of past work: Past work has included (1) extensive surveys of tree mortality, and mortality and physical damage to vegetation on experimentally burned sample plots (2) the prediction of cull following basal wounding, (3) development of a method for evaluating the effect of basal wounding on growth, (4) determination of effect of wounding in growth of important hardwoods, and (5) the development of a theory for appraisal of direct damage and the construction of damage appraisal tables.
Accomplishments during past year: Reexamination of sample plots brought mortality and growth figures up to date. Several sets of permanent fire damage plots were closed out and final reports have been prepared. Additional data were obtained on recent burns for the fire damage appraisal study and investigations of large burns to obtain trespass claim data were made as case tests of the damage appraisal method. In cooperation with the Southern Station and Region 8 a uniform damage appraisal system was prepared for use throughout the entire South by all agencies. This provides the first uniform system available for rating damage. A manuscript describing the appraisal system for the Appalachians was published. Physiological and anatomical changes caused by wounding of hardwoods were determined and a manuscript has been completed. Explanation was obtained for failure of basal wounding to inhibit growth of individual trees.
Plans for next year: The manuscript on the effect of fire wounding on growth will be published. Routine examination of permanent fire plots will be continued, including 15-year remeasurements of controlled burning plots in South Carolina. A report on the latter study will be prepared for publication. A report on the effect of repeated burning of mountain hardwood stands will be published.
Date of completion: Report on effect of fire on growth of hardwoods - 1942. Report of influence of 15 years of controlled burning on southern pine - 1942. Controlled burning study - continuing.
Assignment: G. M. Jemison, L. I. Barrett, J. J. Keetch.

RI - AP
STREAMFLOW
Forest

January 1, 1942

PROJECT STATUS SHEET

Relation of Forest Cover to Streamflow

Field division: Forest influences research.
Work project: Influence of natural vegetation on streamflow.
Line project: Relation of forest cover to streamflow.
Purpose: To determine the place of different forestry and related land use practices in a region-wide program for water and land conservation. This will require the codification of present land use practices in terms of desirable watershed management.

Specific studies will be made of cutting of wood products, of forest land grazing and clearing for agriculture, of forest fires and smelter damage, and of forest planting and other soil rehabilitation measures. The specific application of the above research will be the development of basic principles for scientific watershed management and for coordinating these principles with flood retardation and regional land use planning programs.

Because the subject of land use hydrology has not yet been sufficiently well explored, basic studies are also necessary to explain land use effects in comprehensible terms. These exploratory phases of land use hydrology fall largely within the scope of forest influences research because the natural forest provides the optimum opportunity for the measurement and interpretation of the complete hydrologic cycle.

Review of past work: The codification of watershed management practices has required research along two related lines:

a. Measurement of streamflow from drainage areas under different land use practices.

b. Basic studies essential to interpreting streamflow measurements into terms of land use.

Analysis of runoff and precipitation records have been completed for about 40 small drainage areas, some of which records are available since 1934. The standardization phase of about 15 of these areas may be considered as being completed.

In 1939-40 changes in cover conditions were begun on standardized drainages. These included clearing of the forest and shrub cover for the purpose of carrying out local agricultural practices of the use of steep mountain land for cultivated crops, and preparation of a drainage area for conducting forest land grazing.

Accomplishments during past year: Cultivation of corn carried out for the first time on a standardized drainage area under experimental control.

Eleven head of local yearling stock grazed on another standardized area.

Plans made of a study of effects of logging.

Rehabilitation of sub-marginal pasture land by lime and phosphate program in cooperation with the N. C. State Agricultural Experiment Station and the TVA.

As a pilot study of cutting methods, the limits of transpiration were studied -- see Status Sheet on Water Utilization.

Under basic studies, a formal report on the separation of base flow from the storm hydrograph was presented before the Section of Hydrology of the American Geophysical Union. A report on soil profile characteristics pertinent to hydrologic studies was presented before the American Society of Soil Scientists.

Plans for next year: As a national emergency phase of this project, emphasis will be placed on making the greatest possible practical application of results already available, and having a direct bearing on the efficient use of industrial and municipal water resources. Charts and tables are to be prepared for streamflow prediction in areas of high watershed value.

Cultivation and pasturing of mountain agricultural area.

Continuation of local forest land grazing study.

Study of effects of logging under timber sale.

Study of effects of forest fires.

Under basic studies, a technical report will be prepared interpreting changes in the water economy of a forest drainage area that takes place when subjected to a major cover change. A special report on ground water storage, infiltration, and water movement, as influenced by forest vegetation, will also be prepared.

Date of completion: Continuous.

Assignment: C. R. Hursh, P. W. Fletcher, M. D. Hoover.

RI - AP
CLIMATE
Forests

January 1, 1942

PROJECT STATUS SHEET

Local Effect of Forests on Climate

Field division: Forest influences research.
Work project: Effect of cover on climate.
Line project: Local effect of forests on climate.
Purpose: To determine the influence of forest vegetation upon the meteorological factors of its immediate environment.
Review of past work: Meteorological records that have been obtained in the course of 6 years of watershed studies on the Coweeta and Bent Creek Experimental Forests and in the Copper Basin have furnished basic data for analysis of vegetation effects on climate.

Special studies of local climates were conducted within the major vegetative zones of the Copper Basin for the period of 1934-1940. Sufficient data were obtained during this period to prepare a manuscript report on the project. All stations used in the above study with the exception of station #3 in the denuded zone were temporarily discontinued July 1, 1940. Station #3 is being maintained under a cooperative agreement with the Hydraulic Data Division of the Tennessee Valley Authority.

Accomplishments during past year: A complete revision of all tabular data for the Copper Basin manuscript was made, bringing together all records up to July 1, 1940. Due to other reports being given higher priority, the revision of the entire manuscript was not entirely completed. It has, however, been carried to a point where it can soon be made ready for the board of review.
Plans for next year: Preliminary plans have been considered for an office study relating seasonal temperature to water yield, evaporation and transpiration. On the basis of this study plans will be drawn up for supplementing present temperature records for the Coweeta Experimental Forest if necessary.

Final drafting of revised charts and graphs for the Copper Basin manuscript will be made early in the year.

If time and personnel will permit, further inquiry will be made into seasonal temperature, and streamflow relationships.

Date of completion: Continuous.
Assignment: C. R. Hursh, M. D. Hoover.

RI - AP
WATER UTILIZATION
Forests

January 1, 1942

PROJECT STATUS SHEET

Transpiration and Other Consumptive Uses of Water by Forest Cover

Field division: Forest influences research.
Work project: Water utilization by vegetation.
Line project: Transpiration and other consumptive uses of water by forest cover.
Purpose: To determine the effects of forest cover on transpiration and evaporation, on canopy interception of precipitation, and on other consumptive use forms of water. This project also includes a study of the effects of trees upon soil moisture and ground water.
Review of past work: As a pilot study pertinent to research on the effects of cutting major vegetation, the limits of maximum transpiration draft have been determined through a complete removal of all tree and shrub cover from two drainage areas. On one of these begun in the fall of 1939, all major vegetation was removed, but was allowed to begin to reestablish itself during the growing seasons of 1940 and 1941. On the other area begun in the spring of 1941, all major vegetation was removed and all sprouts were removed as soon as they had developed.

A study of the interception of precipitation by tree canopies has been completed for 4 representative forest types in the 40-inch rainfall zone on the Bent Creek Experimental Forest. A report on this study is now in manuscript form. A second study of canopy interception was begun in the 70-inch rainfall zone on the Coweeta Experimental forest in 1938.

Analysis of records during the past year indicate that well records, when supplemented with current soil moisture determinations, may be used as an index of transpiration, evaporation, and current water storage opportunities. These records serve as an additional check on other methods of determining monthly balances in the water economy of individual experimental drainage areas.

Accomplishments during past year: Analysis of records of runoff from areas on which all major vegetation has been removed indicate that ground water flow is being very measurably increased because of the vegetation change. The interpretation of this fact, however, is complex insomuch as it has also been demonstrated through observations of soil profile that in the southeastern states infiltration and water storage are at their maximum under forest vegetation. The indication at present is that here the forest vegetation is the best cover for industrial and municipal watersheds, but that a better scientific knowledge is needed of how to manipulate the old growth vegetation during critical periods to control excessive transpiration losses.

No definite conclusions can be drawn until the water economy of individual drainages can be more accurately expressed for all

seasons of the year. This will depend upon further studies on storage opportunities and the effect of decaying roots in terms of soil hydrology.

A special study of riparian vegetation was begun in which all major vegetation was cut during the mid-summer in a narrow strip only along the stream channel. This study of riparian vegetation, together with other consumptive use studies, promises to be of much practical value in the management of watersheds where water yield during drought periods may be of a critical factor in public health, and other water supply problems.

Canopy interception measurements were continued on the Coweeta Forest.

The manuscript on canopy interception was revised for publication.

Plans for next year: Continue field records on pilot transpiration studies on the Coweeta Experimental Forest.

Continue canopy interception measurements.

Prepare manuscript on interception for publication.

Compute water utilization data as a part of the complete water economy of individual drainages.

Date of completion: Continuous.

Assignment: M. D. Hoover.

RI - AP
SOIL STABILIZATION
Roadbanks

January 1, 1942

PROJECT STATUS SHEET

Roadbank Naturalization

Field division: Forest influences research.
Work project: Stabilization of soil.
Line project: Roadbank naturalization.
Purpose: To determine practical methods of naturalizing roadbanks, both for appearance and for the purpose of stabilization of the soil against erosion as an item of efficient highway maintenance.
Review of past work: Basic principles of vegetation establishment on roadbanks have been determined through plot studies carried out during the past seven years. These studies were a series of tests covering the practical aspects of roadbank naturalization. Demonstration areas of successful roadbank control under widely different conditions are now available in every section of the Station's territory where roadbanks are a problem. Results of the studies have been given wide distribution in three reports,
Accomplishments during past year: Experimental plots were re-examined and photographs were taken of representative results of different naturalization technics.

Calcium metaphosphate produced by the Tennessee Valley Authority was again used as a fertilizer for treated roadbanks under a wider range of site conditions than last year.

The Station participated in numerous field-training conferences devoted to roadbank control by State Highway Departments and National Forests, and served private citizens in an advisory capacity.

Plans for next year: An extensive report covering principles of roadbank naturalization is now ready for reproduction, and should be available for distribution during the late winter.

No further special plots will be established during the coming year. Old plots will be examined during the months of August and September. The Station will make a special effort to put in practical use the research results that have been obtained to date.

Date of completion: Continuous.
Assignment: C. R. Hursh.

RR - AP
GRAZING MANAGEMENT
Systems of Forest
Range Management

January 1, 1942

PROJECT STATUS SHEET

Systems of Forest Range Management

Field division: Range research.
Work project: Grazing management.
Line project: Systems of forest range management.
Purpose: To find the most practical systems to follow in utilizing suitable forest range types for cattle grazing in the southeastern states; intensive studies at present are confined to the Coastal Plain sections of North Carolina and Georgia.
Review of past work: Studies of different systems of forest range management were started in November 1940. A survey of forest grazing and beef cattle production and preliminary observations of cattle diet were begun in the Coastal Plain of North Carolina.
Accomplishments during past year: The survey of forest grazing and beef cattle production in the Coastal Plain of North Carolina, started in the fall of 1940, was completed. A similar survey was made in the Coastal Plain of Georgia in the spring of 1941. The data collected on these surveys were compiled and the findings summarized into reports. Plans are being made to publish these so that the findings will be readily available to farmers. The North Carolina report will be published by the North Carolina Agricultural Experiment Station, and the Georgia report, by the Georgia Coastal Plain Experiment Station, both cooperators on this project.

Based on the surveys and other available information, a preliminary project analysis was made, working plans developed, and studies of several phases of management practices started this year in the Coastal Plain of North Carolina. These are as follows:

1. Experiment to compare the practice of continuous grazing of the reed type during seven or eight months of the summer with the practices of rotating one time during the season and with rotating every 28 days.
2. Experiment to determine the value of creep feeding calves on the reed type to weaning age, and to compare this with the value of running calves on the reed type in the early part of the season and transferring them to lespedeza pasture until weaned.
3. Experiment to find the effect on the reed type of two rates of grazing in both burned and unburned areas.
4. Experiment to compare wintering weaned calves in the reed forage type versus wintering on the farm.
5. Observations of grazing, and chemical analyses were started to determine the relative palatability, and value of the important forage plants through all seasons of the year.
6. Measurements of rate of growth and development, and observations on general ecological requirements of the important forage plants.

The data collected this summer on these various experiments have not been completely compiled and summarized.

A project analysis and working plans for studies in the Coastal Plain of Georgia have been about half completed. Observations and records on cattle preference for different forage species were made in Georgia.

Plans for next year: Finish compiling and analyze all data collected this year. Carry on with the studies started this year. Complete work project analyses and working plans for studies in both North Carolina and Georgia. Start the following experiments in North Carolina:

1. Experiment to compare the relative value of different planes of nutrition for wintering breeding cows on forest land, and to determine the effect of winter grazing on forage and tree reproduction.
2. Experiment to compare the effect of two degrees of cattle grazing on forest tree reproduction following logging, and to determine the effect of logging and degree of use on carrying capacity.

Start the following experiments in Georgia:

1. Experiment to compare the value of carefully controlled burning of the forest range every two and three years with complete protection.
2. Experiment to determine the relative value of four different systems of managing cattle herds on forest range, as follow: (a) continuous grazing from March 15 to February 1, (b) deferring about 50 percent of the range for fall and winter use, (c) forest range supplemented with improved pasture during late summer and with maintenance feeds after October 15, and (d) forest range from March 15 to February 1, supplemented with cottonseed cake after October 15. All groups fed on maintenance rations and oats from February 1 to March 15.

Date of completion: Project as a whole is continuous -- all phases to be continued for at least three years.

Assignment: H. H. Biswell, R. W. Collins, W. O. Shepherd (for grazing and forestry studies), J. E. Foster, B. L. Southwell, J. W. Stevenson, L. Blake (for cattle production studies -- Bureau of Animal Industry and State Agencies).

RE - AP
FOREST SURVEY
Inventory

January 1, 1942

PROJECT STATUS SHEET

Forest Survey -- Inventory Phase

Field division: Forest economics.
Work project: Survey of forest resources.
Line project: Inventory.
Purpose: To determine the extent, location, and condition of forest lands in the Station's territory and the quantity, kinds, quality, and availability of timber now standing on these lands.
Review of past work: The Forest Survey organization was established at this Station in April 1936. Field work was begun in South Carolina in July 1936 and was extended to North Carolina late in the year. By November 1937, when the field organization was disbanded because of lack of funds, all of South Carolina and the Coastal Plain and Piedmont units of North Carolina had been covered. The Mountain region of North Carolina was cruised during the latter part of 1938, completing the line plot work in the state.

No inventory field work was done in 1939 but, beginning in February 1940, a new field party was organized and work was started in the Coastal Plain of Virginia and was later extended to the Piedmont and Mountain portions of the state. The line plot work for the entire state was completed in December 1940.

Inventory tables of forest area and timber volume were completed for all of the units in North and South Carolina and for each state.

Accomplishments during past year: Inventory field work and the collection of data for construction of volume tables for the Mountain units were completed early in the year.

Basic tables of area and volume were computed for all five Survey units in Virginia and for the State. At the request of the State Forester and several of the pulp companies, a special tabulation was made of the Coastal Plain data to show the forest area and volumes north and south of the James River.

A number of additional tabulations and analyses were also made of the North and South Carolina inventory data for use in the state reports.

Plans for next year: The entire state of West Virginia will be covered with an inventory cruise during 1942. A field party of six 3-man crews will be organized in April and should complete the line plot work by early winter.

Computations of the West Virginia data will start as soon as the first unit is completed.

Volume table field work for West Virginia units will be completed during the year and the tables will be prepared.

The tabulation and analysis of the Virginia inventory data will be completed and assembled in form for inclusion in the unit and state reports.

Date of completion: Indefinite.
Assignment: E. V. Roberts, T. C. Evans, John Carow.

RE - AP
FOREST SURVEY
Growth and Yield

January 1, 1942

PROJECT STATUS SHEET

Forest Survey -- Growth and Yield Phase

Field division: Forest economics.
Work project: Survey of forest resources.
Line project: Growth and yield.
Purpose: To determine the current and probable future rate of timber growth and the productive capacity of the forest area.
Review of past work: Computations of current annual growth were completed for the years 1936, 1937, and 1938 in South Carolina and for 1937 and 1938 in North Carolina.
Accomplishments during the year: The details of a revised growth procedure were worked out which will permit the determination of growth by diameter groups and species groups. Growth computations for the Virginia Coastal Plain unit and one Piedmont unit were completed following this procedure and computations were started for the other units. Preliminary estimates were made of the potential forest growth possibilities of the Carolinas and Virginia.
Plans for next year: Growth computations for the Virginia Piedmont and Mountain units will be completed.

Growth data for North and South Carolina will be carried forward through 1940.

Date of completion: Continuous.
Assignment: T. C. Evans.

RE - AP
FOREST SURVEY
Drain

January 1, 1942

PROJECT STATUS SHEET

Forest Survey -- Drain Phase

Field division: Forest economics.
Work project: Survey of forest resources.
Line project: Drain.
Purpose: To determine the volume of timber cut annually for industrial and domestic use.
Review of past work: Complete mill-to-mill canvasses of primary wood-using industries were made in South Carolina during 1937 and in North Carolina during 1938 to obtain records of the volume of timber cut in the previous year. In succeeding years lumber production data have been obtained through a cooperative agreement with the Bureau of the Census by which the Survey edited and checked all schedules from sawmill operators and made such field checks as were necessary to obtain reports on the more important delinquent mills.

Data on non-lumber industries have been obtained by direct field contact or by letter.

Tabulation and analysis of the production data through 1938 were completed. The 1939 data obtained by the Decennial Census enumerators were tabulated but were not completed as there appeared to be a number of mills unreported.

Accomplishments during past year: A complete canvass was made of primary wood-using industries in Virginia. Reports were obtained for 2761 sawmills and for 155 other primary forest industries. Census schedules were also completed for all sawmills and were forwarded to Washington.

In North and South Carolina schedules mailed by the Census to sawmill operators were returned to this Station for editing and checking. After four notices had been mailed, Survey field men checked every county for non-reporting and new mills. More than two-thirds of the 3991 sawmill reports received from the two states were obtained in the field follow-up.

The field men also checked 1939 lumber production in the Carolinas and found a number of mills that had not been reported that year. They also obtained reports on operations in the first six months of 1941 which have provided a basis of estimating total production for this year.

Production of non-lumber industries in the Carolinas for 1939 and 1940 was also obtained during the field follow-up.

In Virginia a special study was made of fuelwood consumption. Farm, rural non-farm, and urban families, commercial establishments and other fuelwood users were sampled to obtain information regarding the quantity and kind of fuelwood used. Fuelwood consumption figures have been compiled for each of the Survey units, based on the findings of this study.

The timber requirements of coal mining companies in Virginia and in adjacent areas of West Virginia and Kentucky were also investigated. A total of 87 companies which produce about half of the coal mined in the three states were questioned regarding their wood requirements.

During the year production data for 1939 and 1940 have been assembled for Virginia, North Carolina and South Carolina and drain figures have been computed for the Virginia units.

Plans for next year: Although a definite agreement has not been made with the Bureau of the Census regarding the collection of lumber production records for 1941, it is assumed that the Census of Lumber Production will be made. Tentative plans provide for having the schedules from mills in Virginia, North Carolina and South Carolina returned to this Station for editing and checking before being forwarded to the Census. Survey field follow-up will be confined to checking the larger mills that fail to reply to the mailed questionnaires.

Production and drain records for North and South Carolina will be completed for 1939 and 1940 during the year. A detailed analysis will be made of the 1940 Virginia mill reports to obtain information regarding employment, equipment, method of operation, capacity, and land ownership.

Date of completion: Continuous.

Assignment: G. E. Morrill, John Carow.

RE - AP
FOREST SURVEY
Reports

January 1, 1942

PROJECT STATUS SHEET

Forest Survey -- Report Phase

Field division: Forest economics.
Work project: Survey of forest resources.
Line project: Reports.
Purpose: Analysis and interpretation of data. Determination of the place of the forests in the social and economic life of the region and nation. Preparation of reports.
Review of past work: Reports for the three survey units in South Carolina and for the two Coastal Plain units and the Piedmont units of North Carolina were published. The first draft of the state report for South Carolina was completed.
Accomplishments during the year: The report for the Mountain unit of North Carolina was published completing the series of unit reports for the state.

Two special releases were prepared and published showing the distribution of commercial tree species in South Carolina and North Carolina.

The forest area, timber volume and growth and drain sections of the South Carolina state report have been revised and brought up to date. The final sections, on the interpretation of findings and recommendations for action, are now being revised preparatory to resubmitting the report for review.

The North Carolina state report was completed and has been reviewed by the State Forester and the Regional office. Revisions have been made following these reviews and the report is being assembled for presentation to the Washington office.

A summary of the forest situation in North Carolina with recommendations for state action was prepared for the North Carolina Board of Conservation and Development.

Reports for the Virginia Coastal Plain and Piedmont units were approximately 60 percent completed at the end of the year.

Supplementary reports outlining the forest situation in local areas have been prepared for state and county planning boards, state foresters and for forest industries.

Plans for next year: Completion of revision of South Carolina state report. Reports for both South Carolina and North Carolina to be submitted to the Washington office.

Completion of unit reports for Virginia and first draft of state report.

Preparation of special reports on commercial tree distribution and on forest industries in Virginia.

Continue to cooperate with defense agencies, planning boards, state forestry organizations, other public agencies, and private companies and individuals in making available Survey findings and in planning means of improving forest conditions in the region.

Date of completion: Continuous.
Assignment: E. V. Roberts, J. W. Cruikshank, W. A. Duerr.

RIFC - AP
WATERSHED SURVEYS

January 1, 1942

PROJECT STATUS SHEET

Watershed Surveys

Field division: Forest influences research.
Work project: Flood control surveys.
Line project: Watershed surveys.
Purpose: Detailed field surveys of approved watersheds to determine the conservation or minor engineering measures needed to retard runoff and control soil erosion for flood control, to determine a plan for installing and maintaining these measures, and to determine their economic feasibility.
Review of past work: In 1938 and 1939 the Station cooperated in a survey of the Coosa River watershed above Rome, Georgia. In 1939 and 1940 the Station also cooperated in a survey of the Pee Dee watershed. During 1939 and 1940 a survey was also in progress on the Potomac watershed under Station chairmanship.
Accomplishments during past year: During 1941 the field survey was completed on the Potomac watershed and the field report written. During 1941 the Station also assisted in the revision of the Coosa survey and report. The Station also assisted in the Pee Dee survey up to July when our personnel were released and placed on other work.
Plans for next year: During 1942 the only work contemplated is a check of the Potomac field survey report after which the final report will be prepared and transmitted to Washington.
Date of completion: Checking and preparation of Potomac survey report, March 1942.
Assignment: H. J. Loughead, O. K. Krogfoss.